LETTERS TO THE EDITOR continued from p.75

Electromagnetic paradox

Dear Sir—I must apologise to J. E. Allen, K. J. R. Wilkinson (13th Dec. 1973 *E&P*, p.561), and to the writers of six unpublished letters, and possibly even to others who spent time over my paradox but did not go to the length of sending in the results. In a misguided endeavour to be brief, I failed to make clear that the discrepancy to be explained was not between the two relativistic views, but between either or both of them and classical theory. Consequently, those who were good enough to join in devoted themselves to explaining in various ways that in relativity theory the net force between the electron beams would be seen to be the same whether the observer was stationary relative to the electron guns or to the electrons in the beams. The former sees 'magnetic' attraction between the electrons, which the latter does not; but he also sees greater electric repulsion than the latter, the two effects exactly cancelling out. I ought to have mentioned that I was aware of this.

My point was that there did not appear to be any reason why the electric force of repulsion between the electron beams, as experienced by the electrons themselves or judged by an observer travelling with them, should not be quantitatively the same in relativity theory as in classical theory. But whereas in classical theory this force would be partly offset by magnetic attraction, to the extent of $(v/c)^2$, in relativity theory there would be no such offset. This would appear to provide an experimental check on the validity of the theory of relativity, since the fact that v (the velocity of the electrons) can be made a fair-sized fraction of c should enable the difference in deflection of the beams to be measurable. The same difference would be predicted by the stationary relativity observer, since, although he would agree with his classical colleague on the existence of a magnetic component of force, he would disagree on the value of the electric component and so would agree with his beam-riding colleague as to the net force.

Put another way, classical theory does not admit that electric and magnetic forces depend on the state of motion of the observer; so to an observer travelling with the electrons there would still be a magnetic force between them. According to relativity, this force would not exist. But the electric force should be the same for both. So there would be a discrepancy in the evaluations of the net force, capable of being checked experimentally. If this were so, surely someone would have added it to Einstein's astronomical tests of the validity of his theory of special relativity.—Yours faithfully,

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